

# CS10818: Integrated BIM Processes for Construction Layout and Validation

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**BIM Business Manager - Europe**

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# Class summary

**This class will be delivered by Topcon Corporation and a European BIM 360 software customer and will show the impact of using Autodesk Point Layout (APL) software and BIM 360 tools combined with Topcon's LN-100 Layout Navigator to achieve improved efficiencies for integrated construction layout and as-built validation.**

**The project was defined as part of the Topcon/Autodesk BIM Implementation program and will demonstrate new workflows using Revit software, Navisworks software, and APL software, and subsequent use of BIM 360 Layout software on a connected iPad.**

**We will focus on business benefits and return on investment achieved using these new innovative processes.**

# Key learning objectives

At the end of this class, you will be able to:

- **Discover the benefits of Autodesk Point Layout (APL)**
- **Discover Revit capabilities with APL**
- **Learn about Navisworks capabilities with APL**
- **Learn about using BIM 360 Layout with Topcon LN-100**

# CS10818: Integrated BIM Processes for Construction

## Layout and Validation



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# Agenda

- **Introduction to Topcon**
- **Topcon Solutions**
- **Integrated BIM workflows**
- **BIM Innovation Program**
  
- **Introduction to TBI**
- **TBI project case study**
  
- **Introduction to CAD & Company**
- **Project feedback, ROI, Benefits**
  
- **Summary and next steps**
- **Q&A**

**John Foster**

**Jeroen Pat**

**Rob Oud**

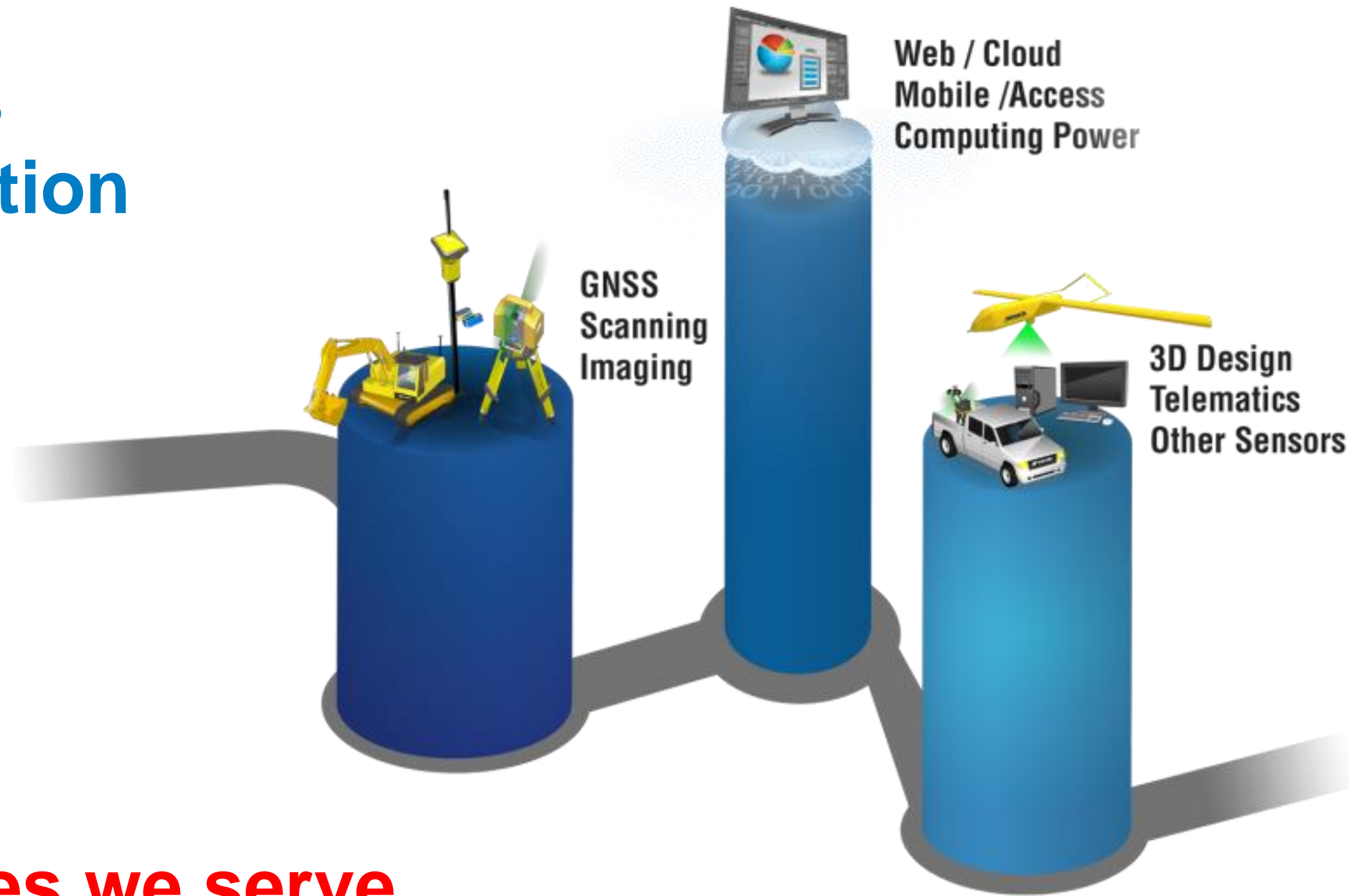
**Jeroen Mennink**

# Topcon Innovation

- **Founded:** 1932 Tokyo, Japan
- **Turnover:** \$1.5 billion
- **Employees:** 3000 worldwide
- **10% of revenues invested into R&D**



# CRR Continuous Representation of Reality



**Our Vision  
For Industries we serve**

# Mass Data Collection Portfolio



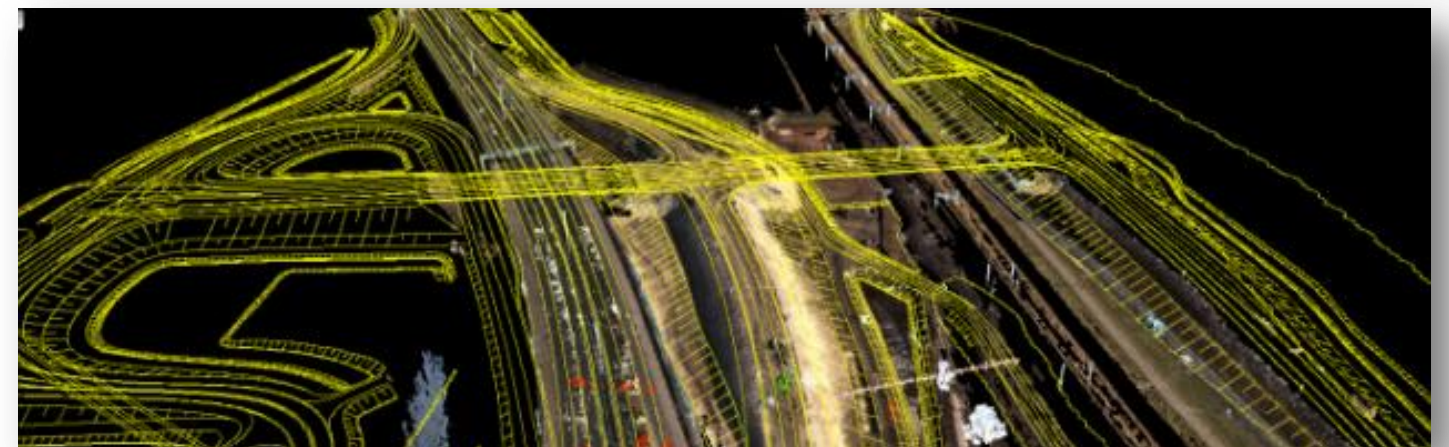
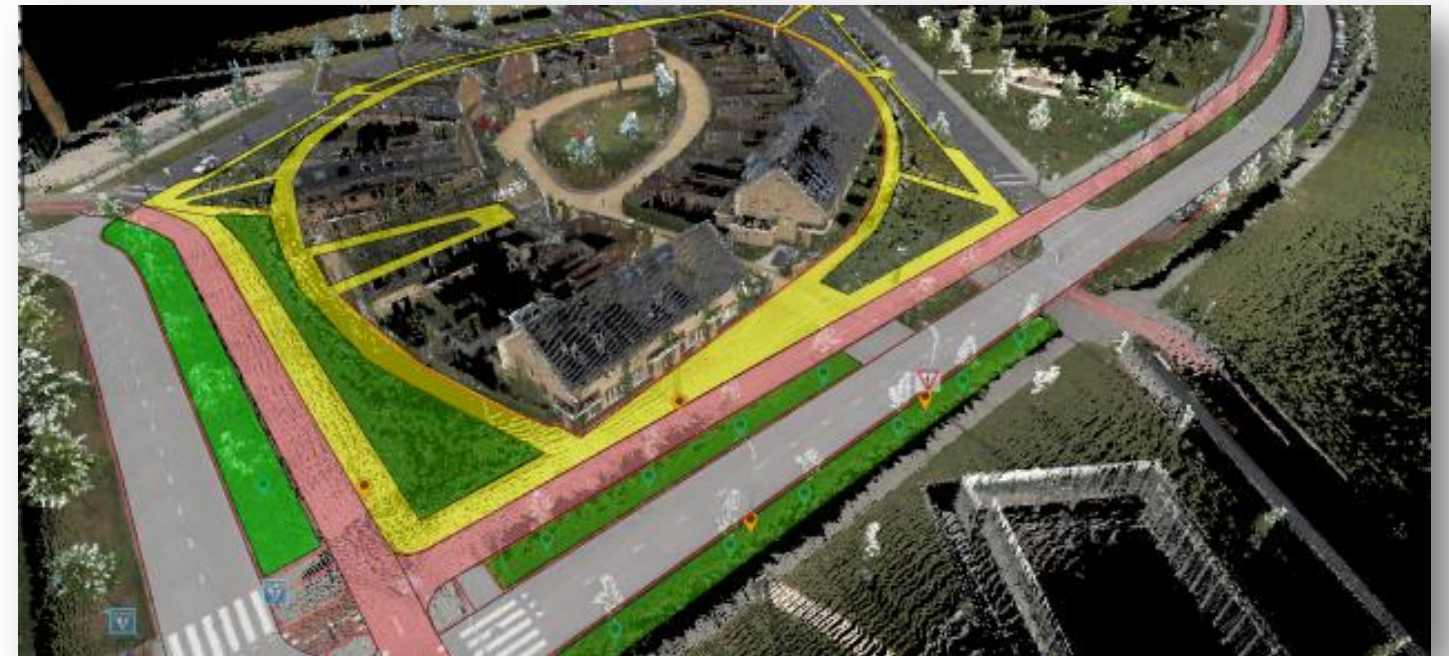


# Mass Data Collection Portfolio



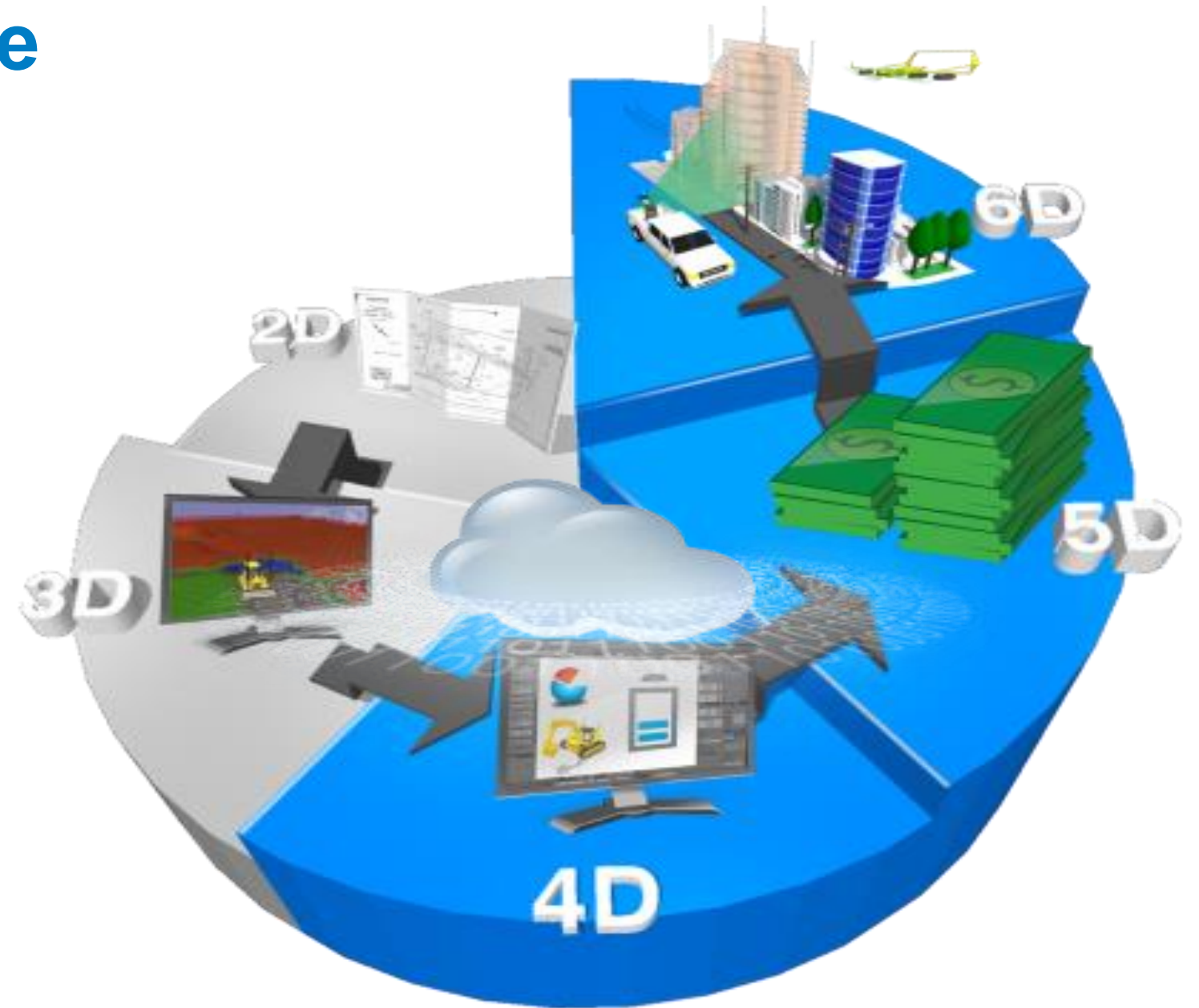
# Applications

- **Tendering ground data**
- **Topographic mapping**
- **Survey**
- **Inspection**
- **Scan to CAD/BIM**
- **Progress monitoring**
- **Asset Management**
- **Visualisation**





# BIM is Workflow optimization not just hardware and software





# Model Driven Layout



## Layout

**Concrete forms**  
**Anchors**  
**Rebars**  
**Sleeves**  
**Drainage**  
**Piling**  
**Walls**



## As-built

**Verification**  
**Quality Control**  
**Measurement**  
**Audit Trail**



# BIM Innovation Program

Current EBA BIM360 Layout/QC pilots in EMEA

**SKANSKA**



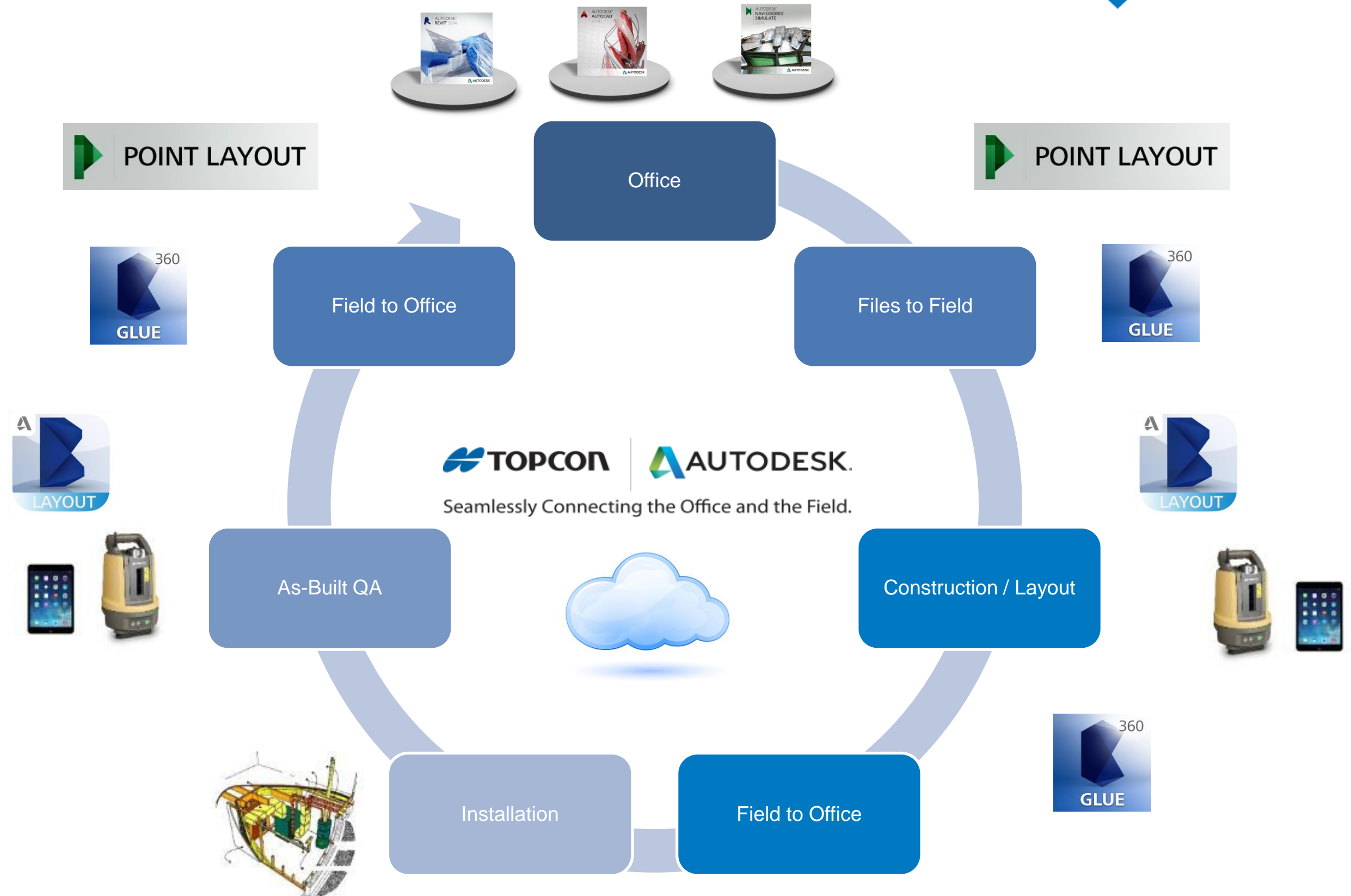
**Balfour Beatty**



# The Hardware Concept: Why?

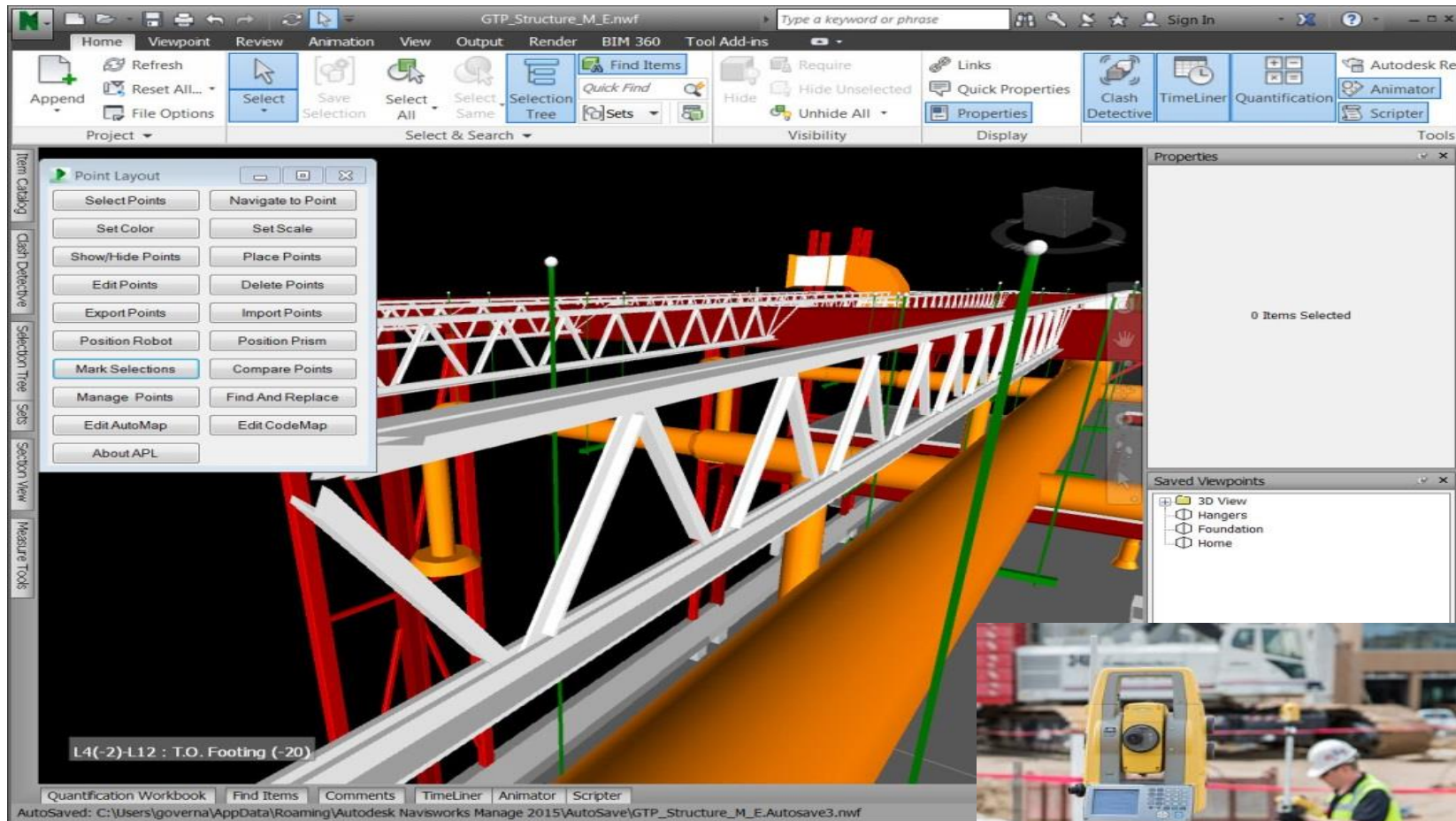
- Demand for Simple Integrated Layout Solution
- Unique and accessible
- Accurate
- Easy to use
- One person operation
- Internal and smaller external sites
- Scalable
- BIM enabled







# The Process: It Starts with Autodesk Point Layout



## What is it:

Create and manage points within the BIM/CAD model.

Export/import coordinate data to the field making construction layout, QA/QC and as-built modelling faster and more accurate.

## Benefits:

- ✓ Help establish project wide control & collaboration across all trades
- ✓ More coordinated, model-driven field layout
- ✓ Improved QA / QC in the field
- ✓ Improved Owner As-Built models
- ✓ Help reduce time and cost of construction



# with Autodesk BIM 360 Layout



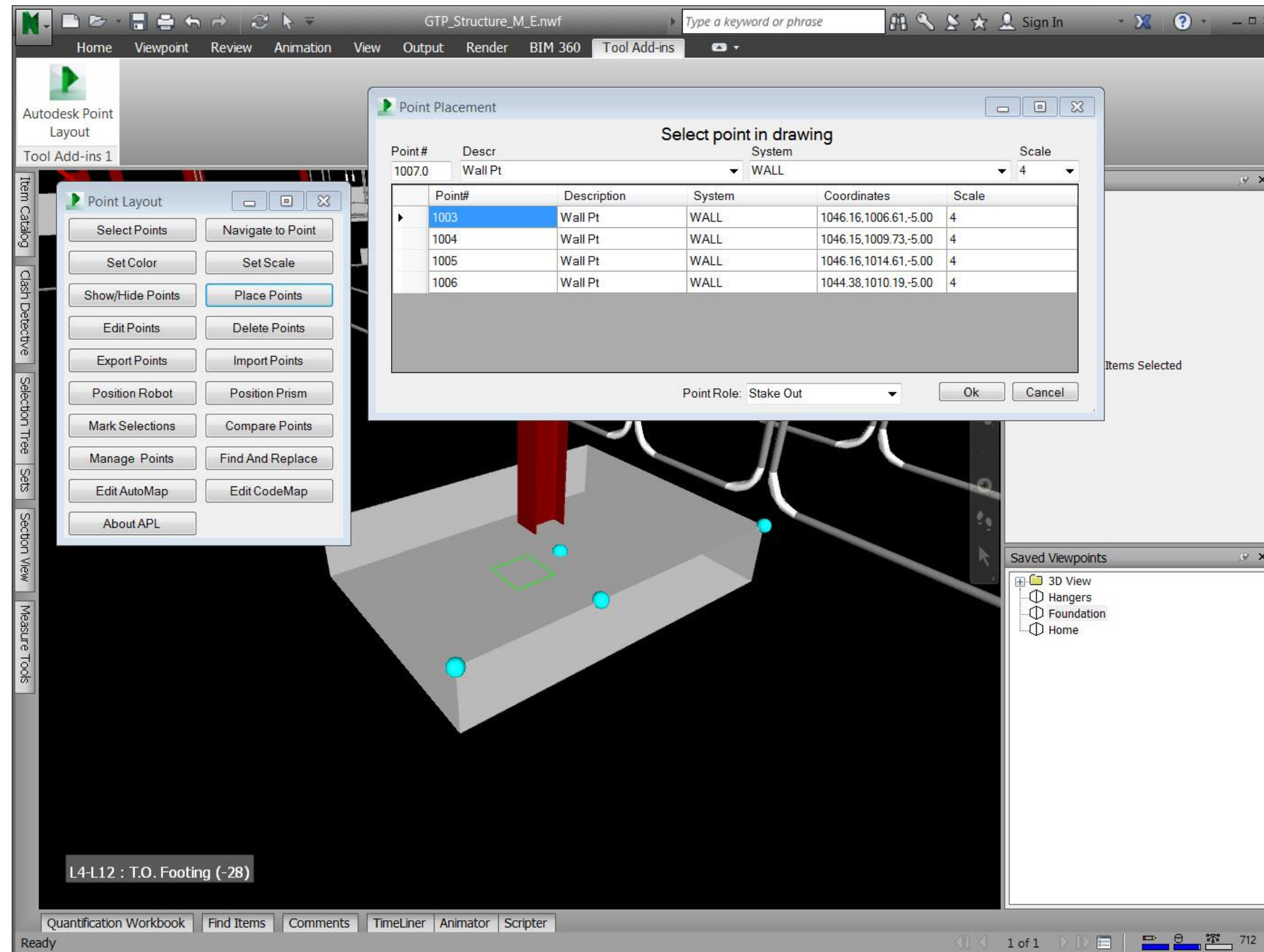
**REVIT, AUTOCAD NAVISWORKS with APL**



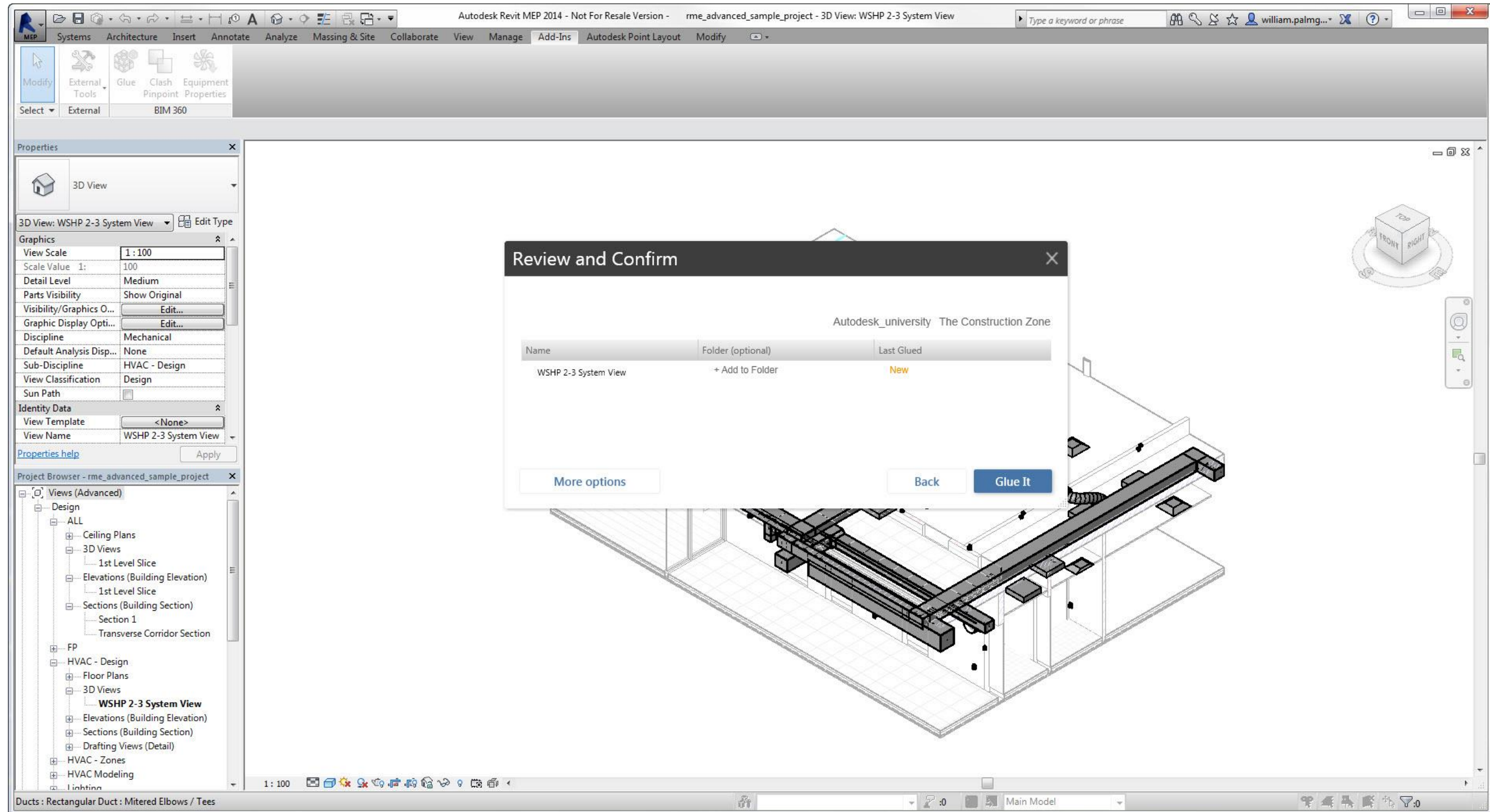
**Glue Up the Model with APL Points**



## Add Points to Model using APL

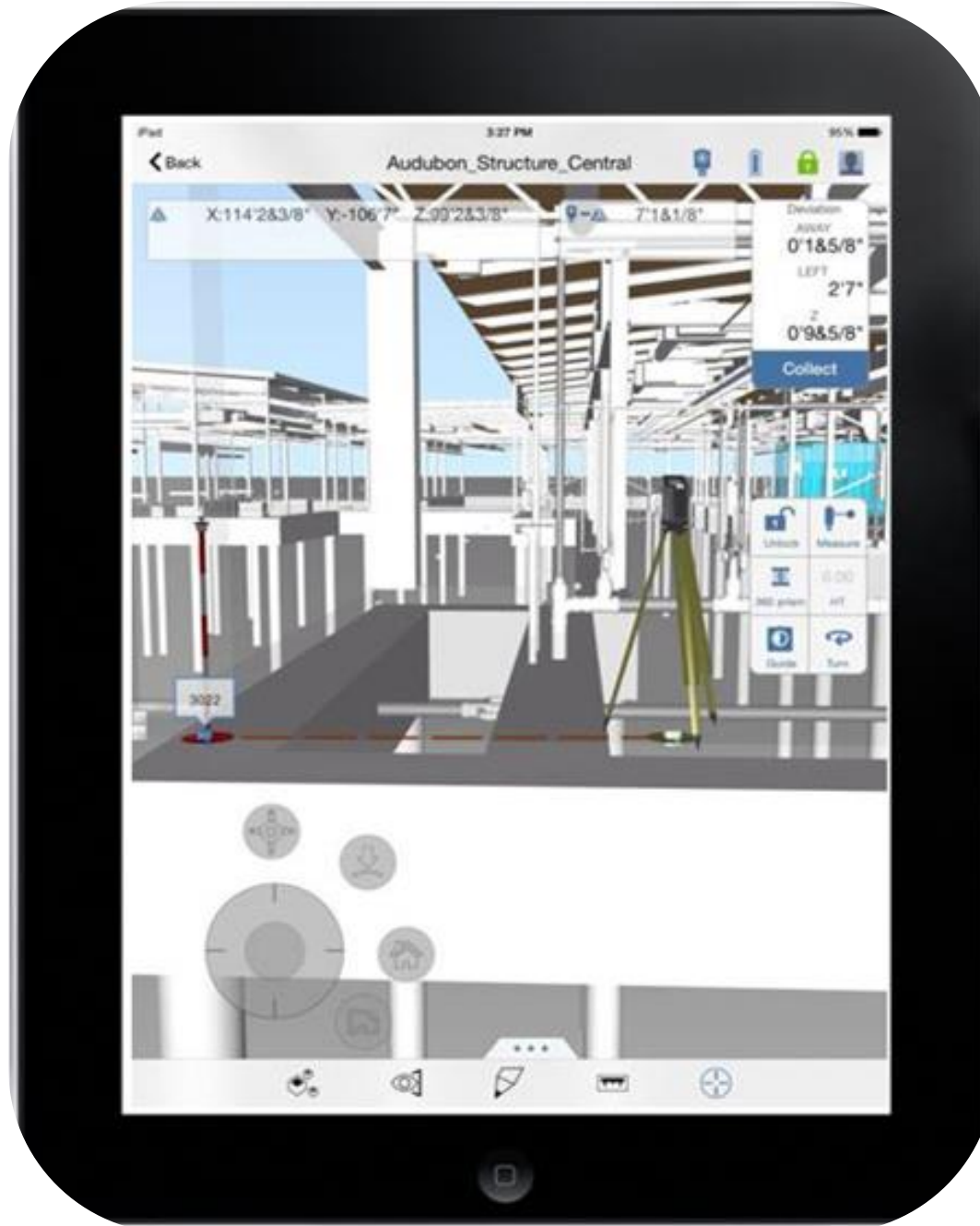


## Glue up the Model with the APL points





Use the Topcon LN-100 with the Autodesk BIM 360 Layout App to layout or collect as-built







**The app running on an iPad provides a first person—immersive view of the building model as the user walks the jobsite.**

The prism and total station are represented in the 3D model as they are located in the physical world—giving the user an understanding of where they are in relation to the instrument, and the points to be staked.



Walking to a point represented in the app's digital model on the iPad is also user intuitive. The BIM 360 Layout app features **audible alerts that get louder and faster as proximity to the selected point increases** as well as a visual "bulls-eye" marker that changes from red to green when the user is within staking tolerance.









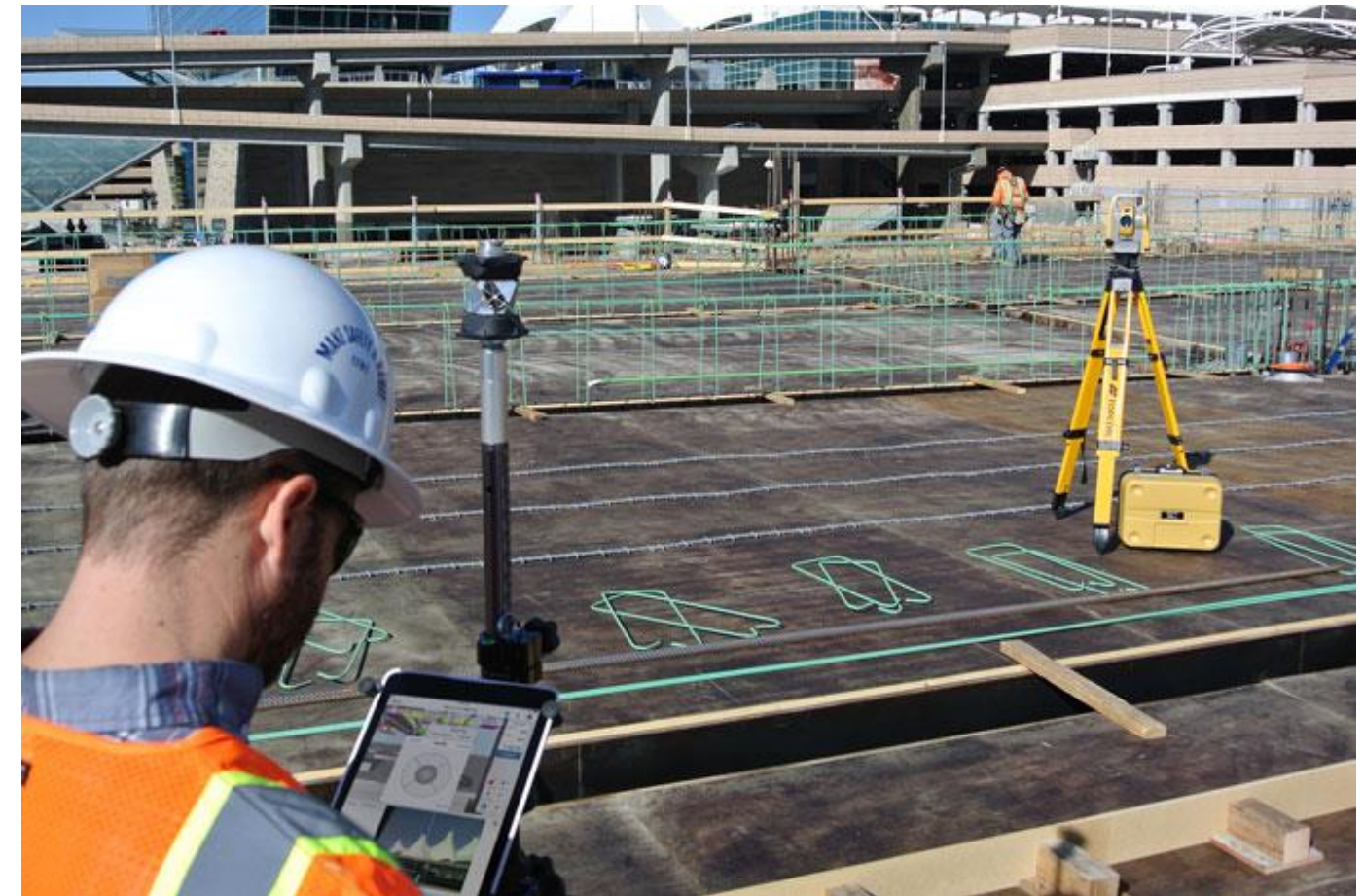






# Imaging Robotic now BIM enabled

- Longer range Layout / Validation
- Reflectorless
- Imaging Camera
- Complements the LN-100
- For more complex structures



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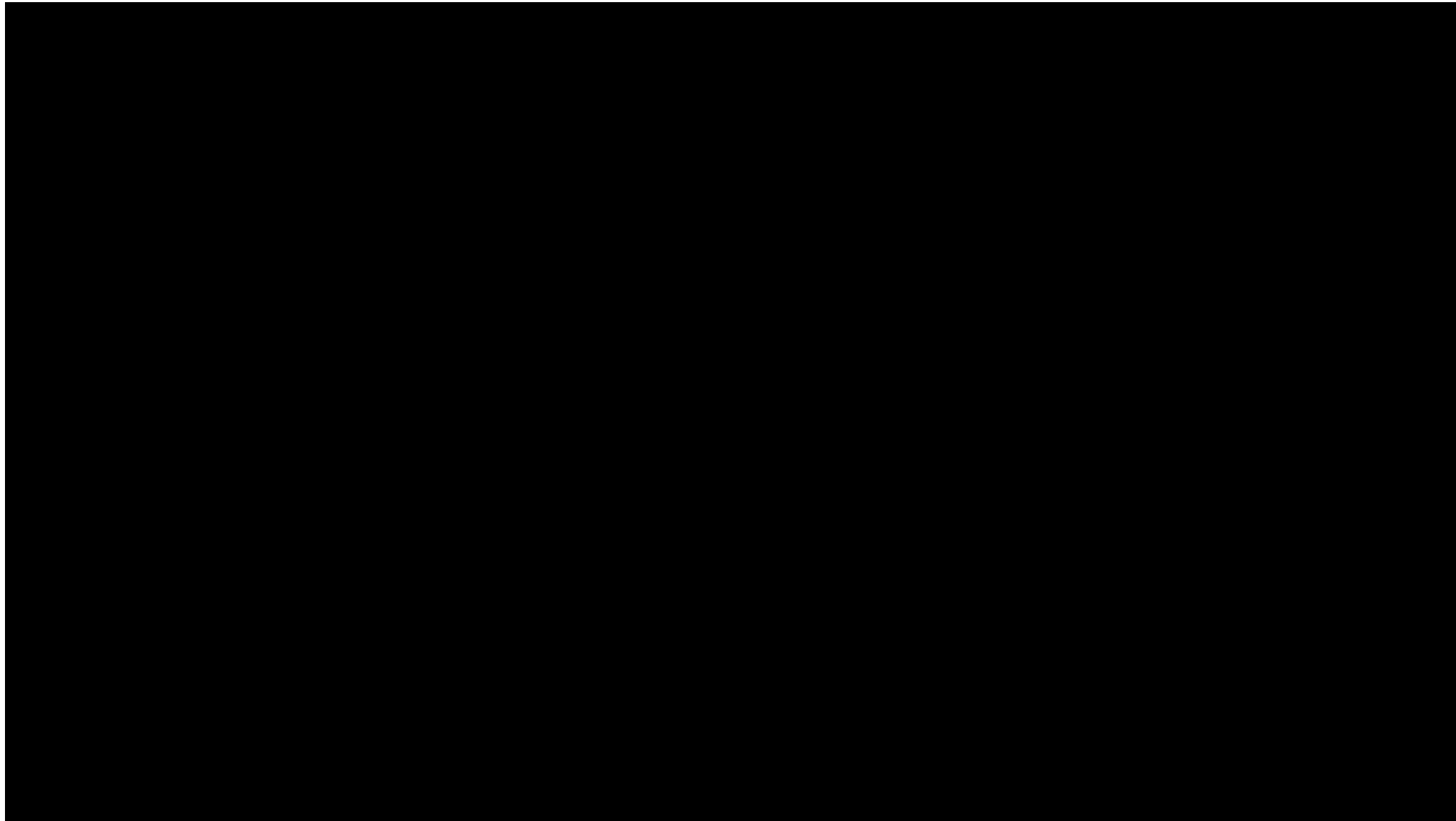
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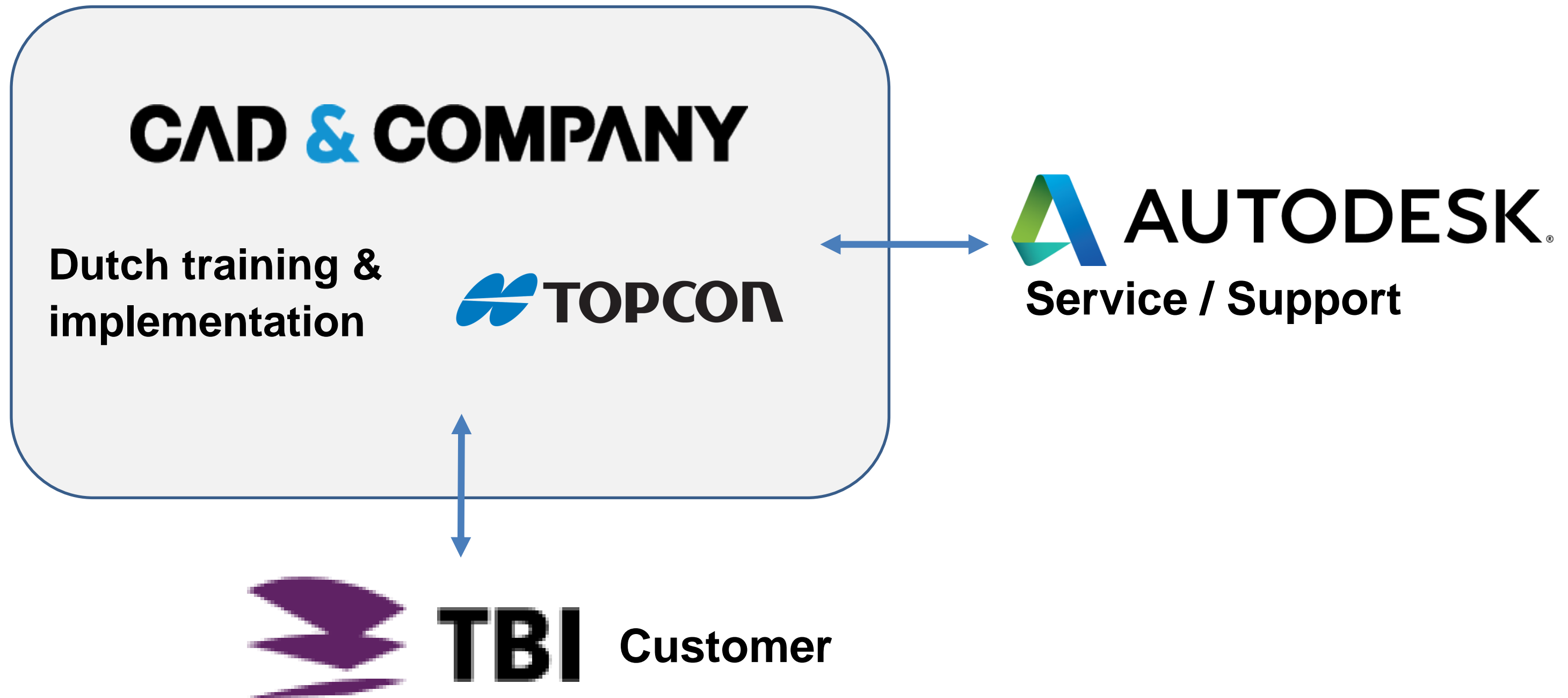
# BIM Integrated Layout

## Team

- TBI-Knowledgelab – Customer (EBA)
- Autodesk
- CAD & Company – BIM360 adviser
- Topcon – Hardware



# BIM Integrated Layout

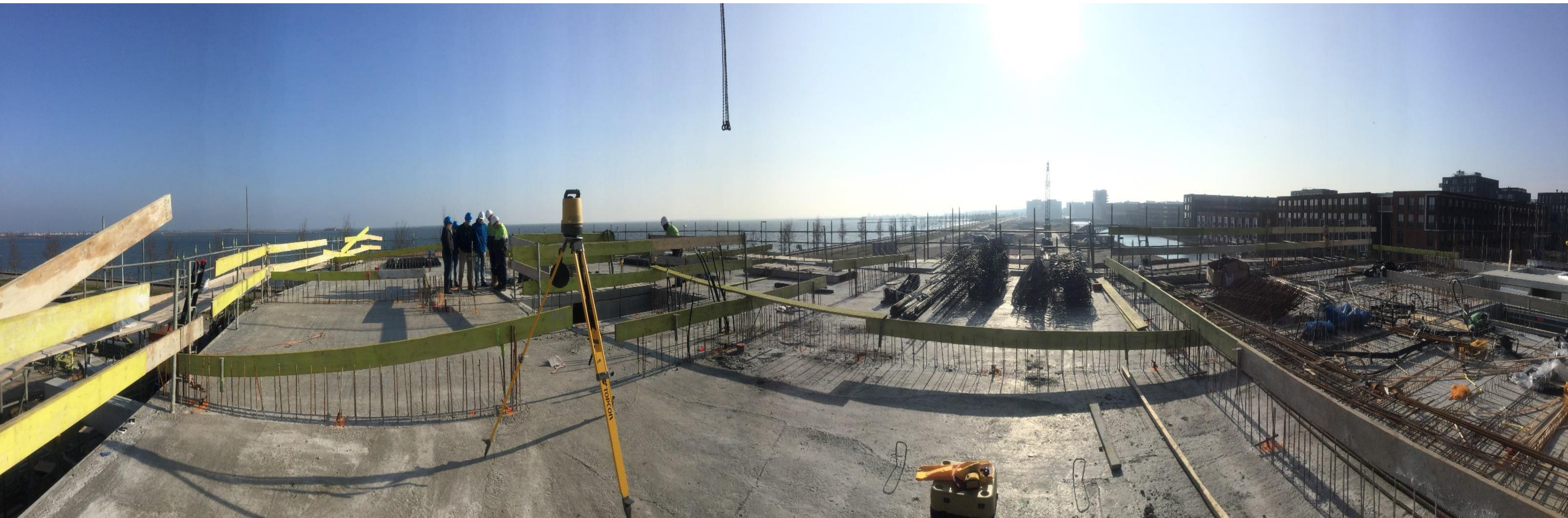




# Pilot

TBI enters into EBA

First Dutch client working with APL / BIM360/  
Topcon Layout Navigator





# March 2015 – Consider the options...





# Pilot #1

## Project IJburg

- Create points in AutoCAD and Navisworks (training)
- Save and transfer with Autodesk BIM 360 Glue
- Hardware test with Topcon LN-100 and iPad application





# Pilot #1

## Project Conclusion

- Easy to use
- Visually attractive
- Number of errors

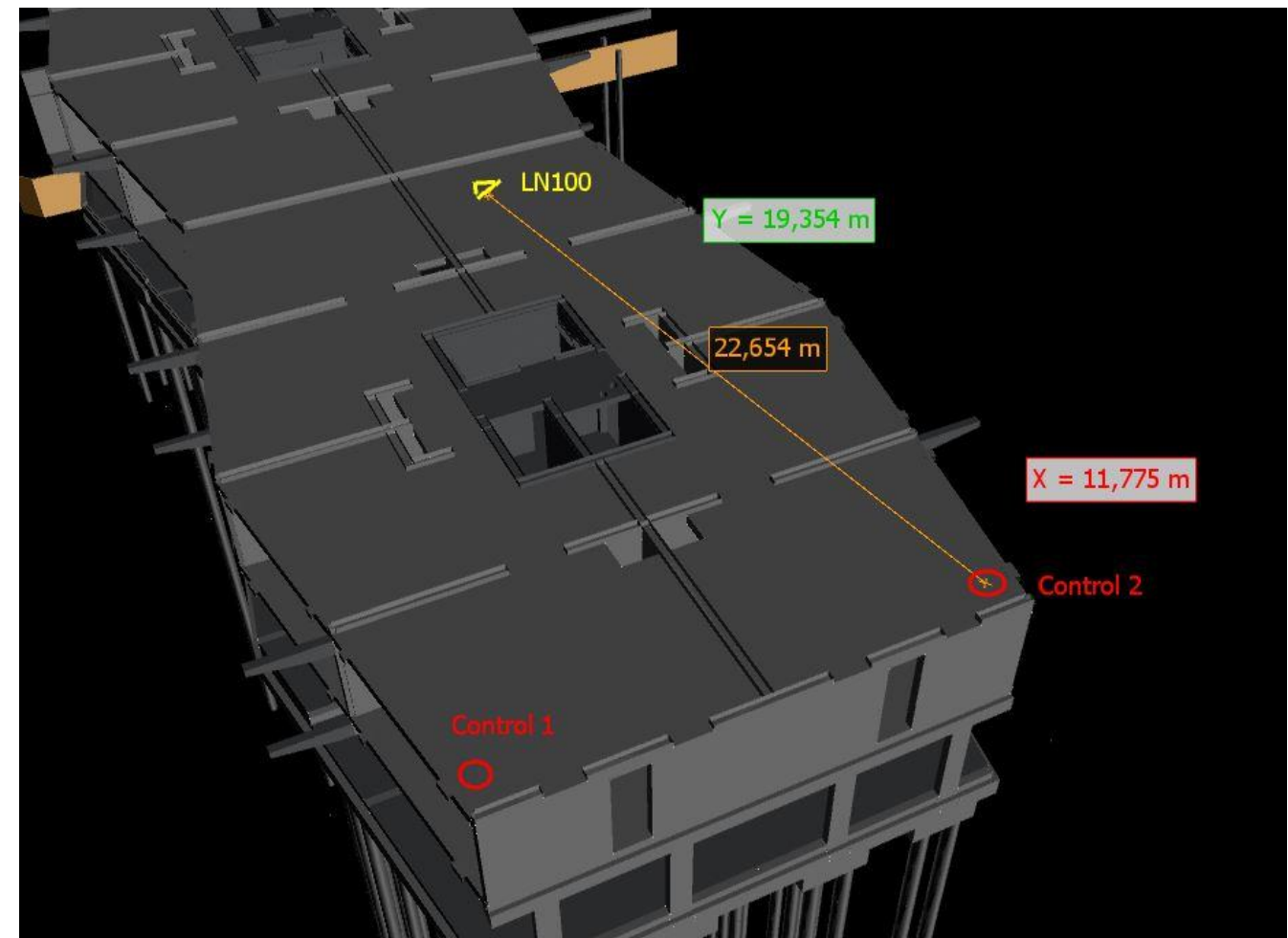
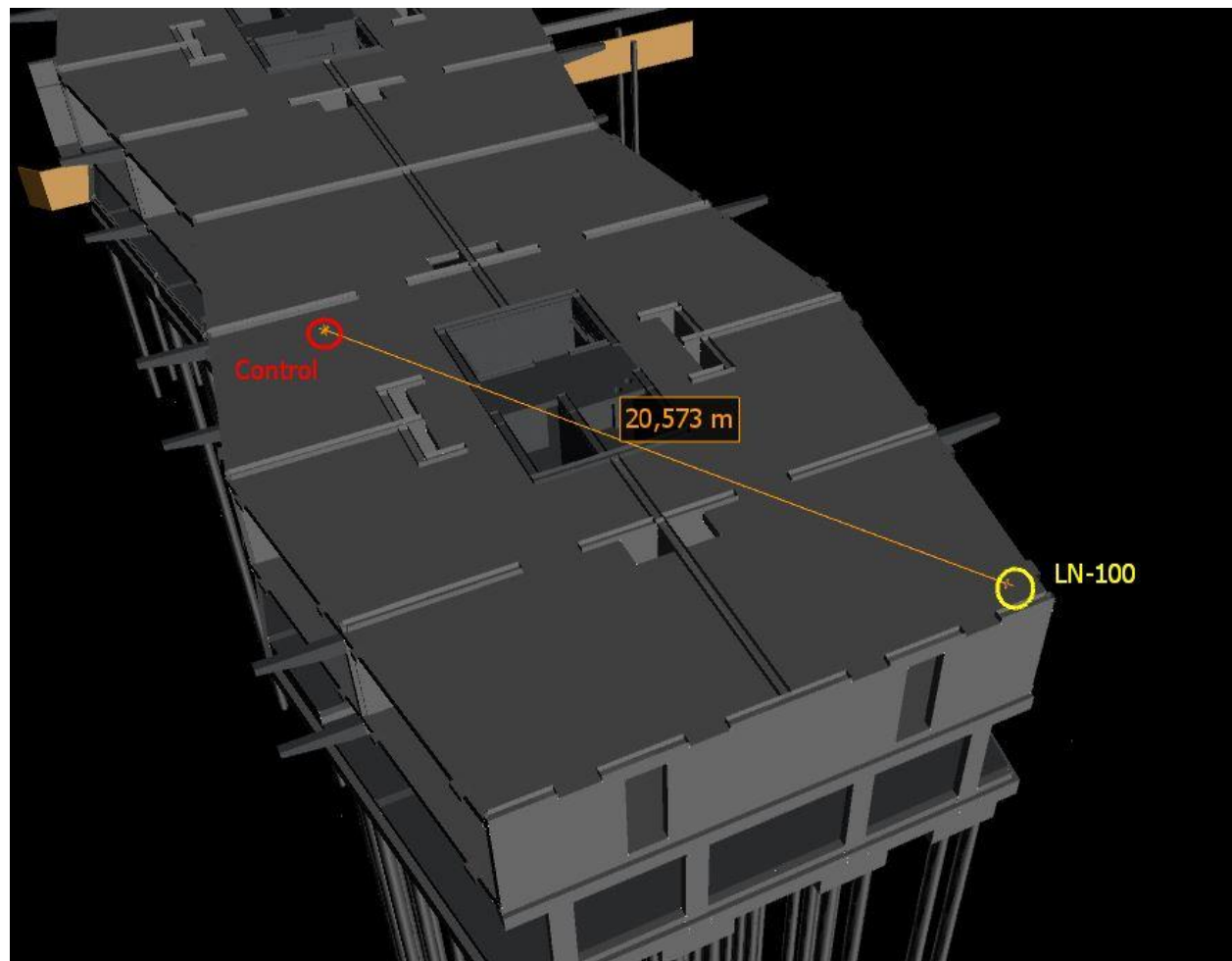




# Results – 15th March

**Orientation and positioning not accurate:**

**Prism may not be programmed correctly in the app software.**





# Problem solved – 17th March

**Downloaded and re-tested new app**

**Cause: app software problem with prism and conversion**





# April 2015 – Set Out points on location

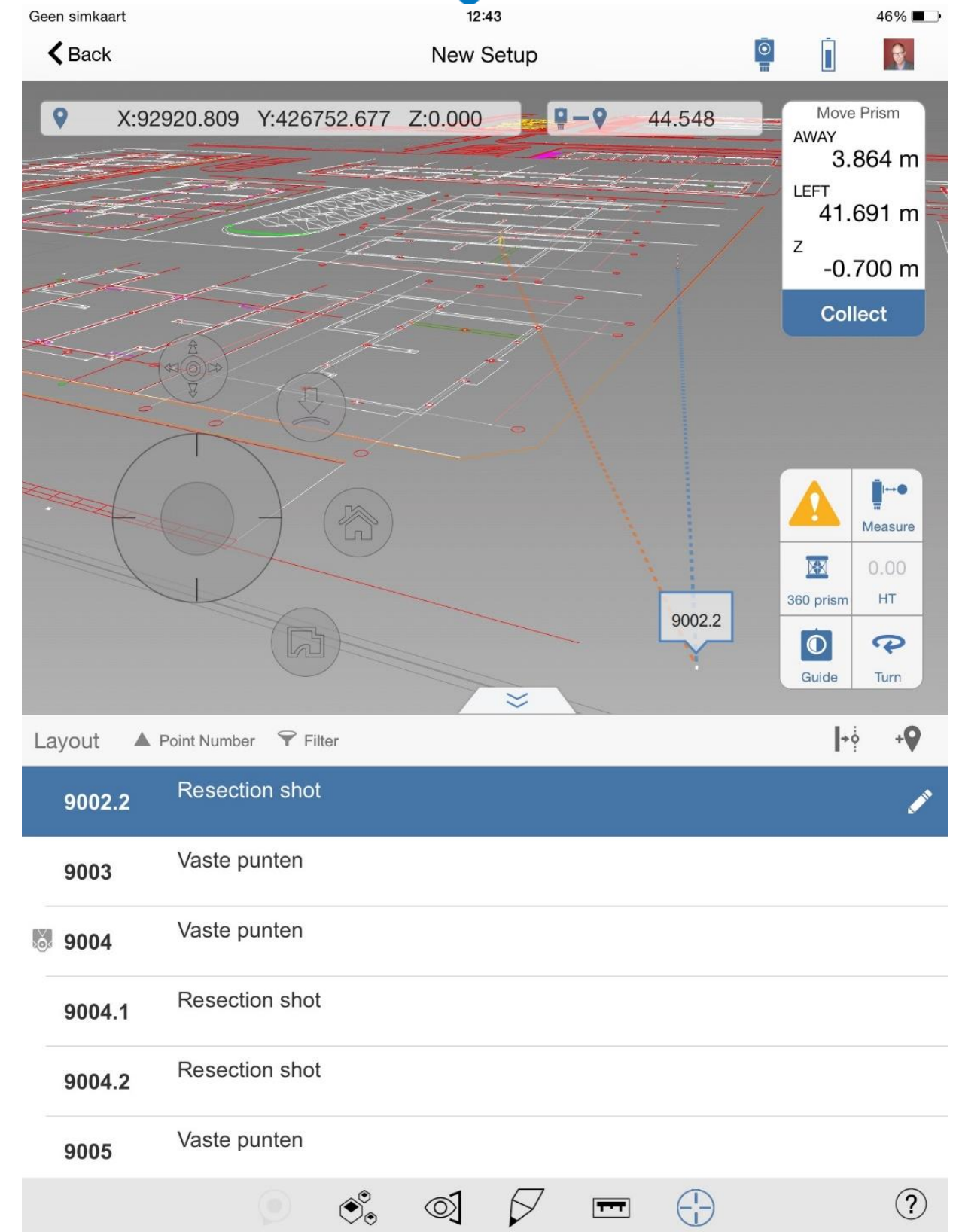
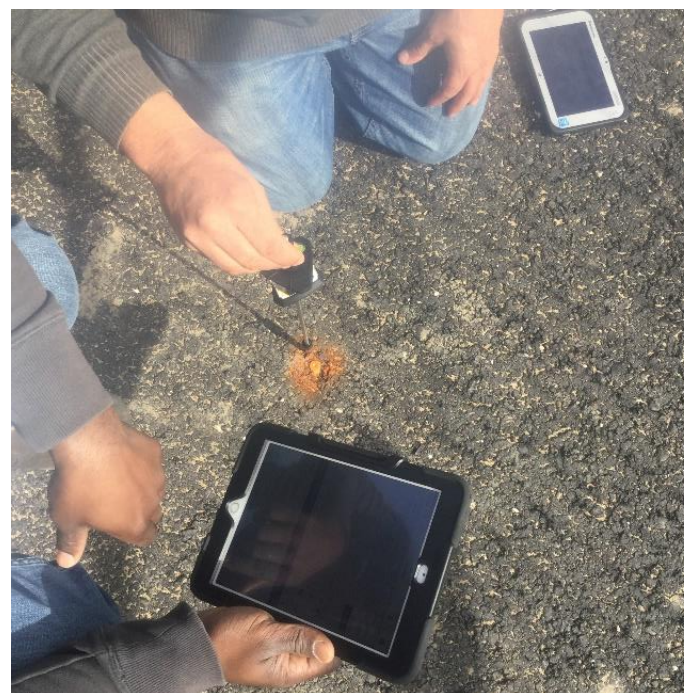




# Pilot #2

## Project Heinenoord

- Points were prepared in Autodesk Point Layout and saved in BIM 360 Glue
- Set out points for the foundation

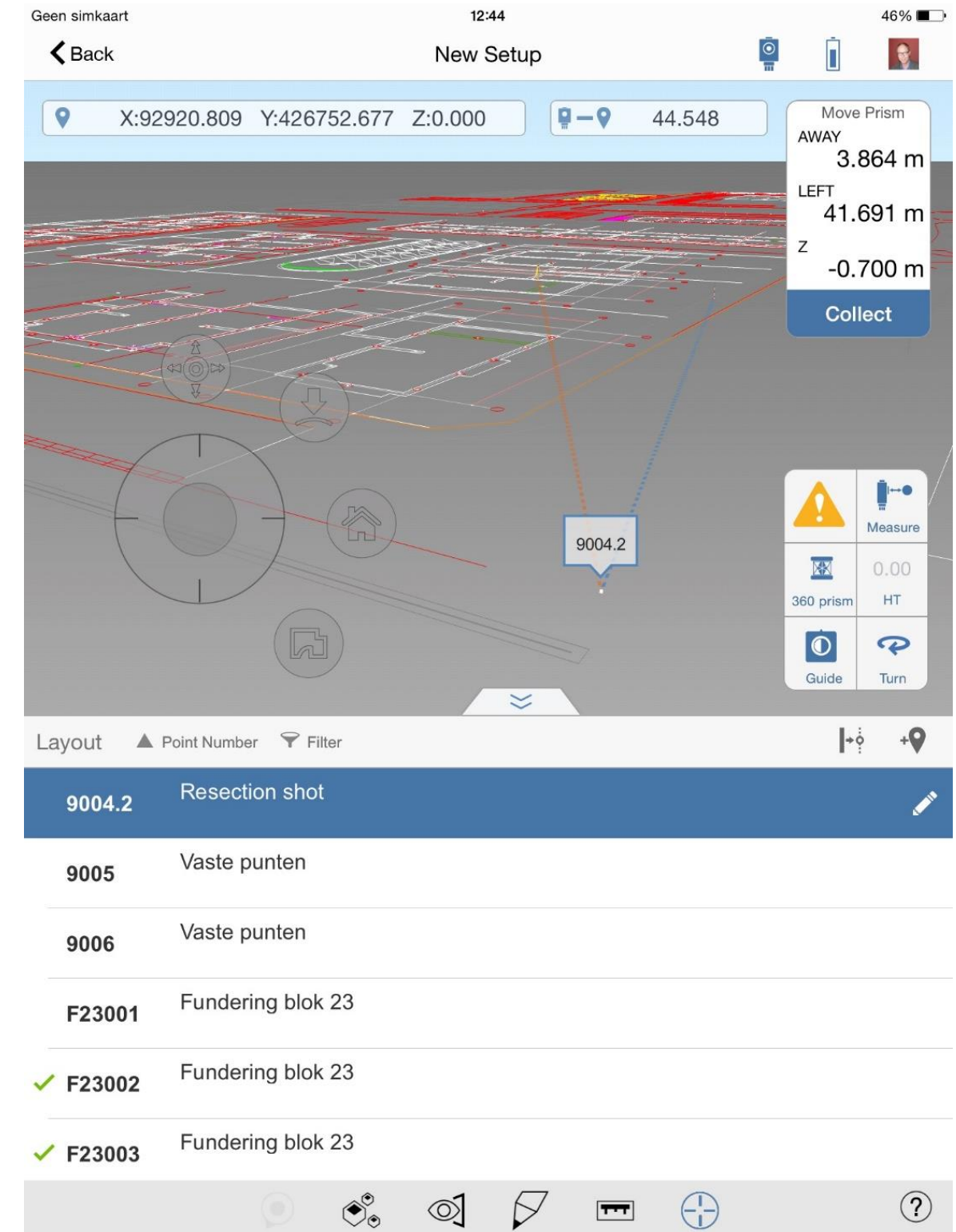


# Results – 13th April

## Project Conclusion

Quick and easy to position the points  
One operator is enough

Problem with layout app (re-section)





# Problem solved – 30th April



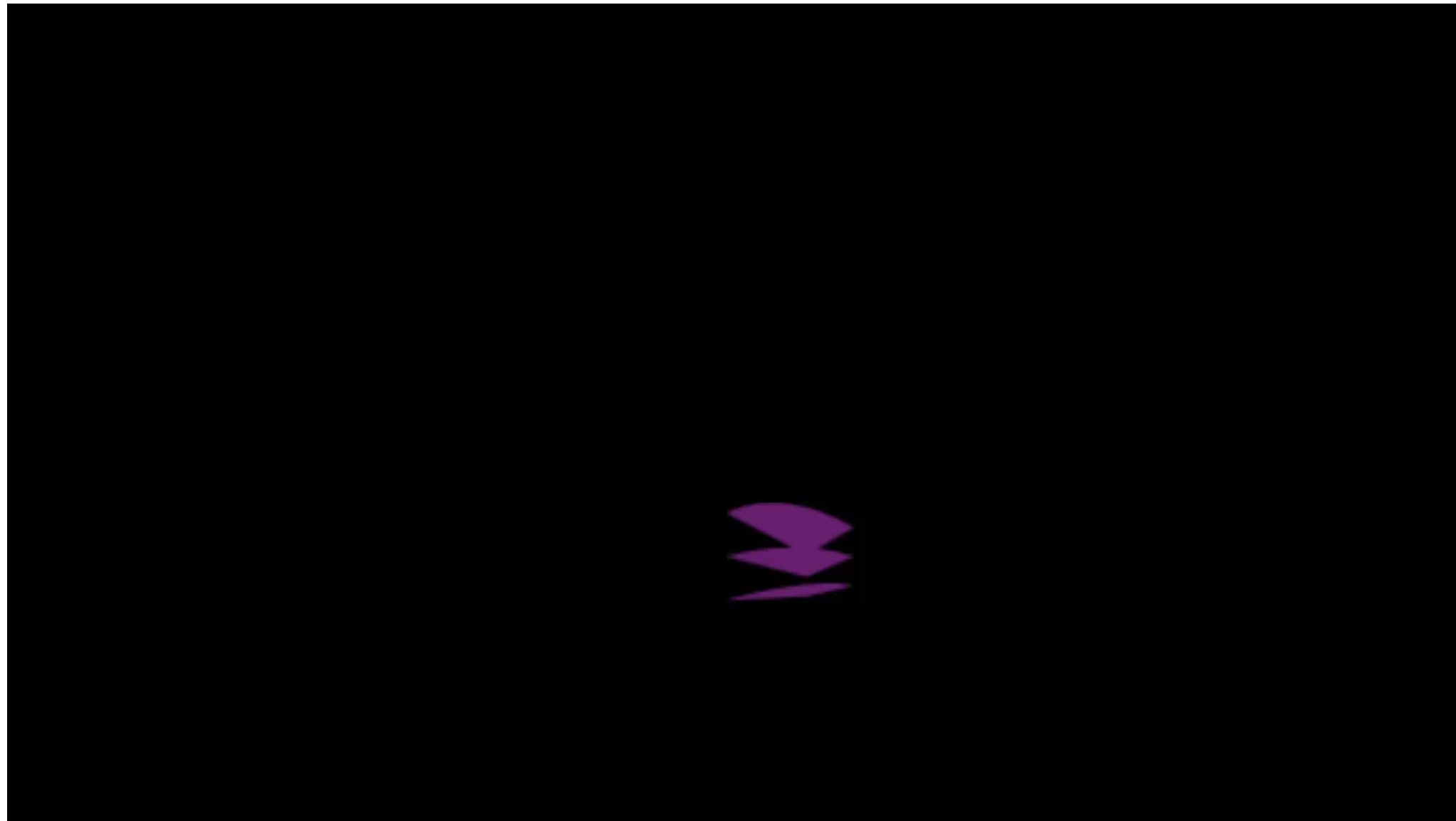


# Proven Technology

After these two pilots the surveying engineers responsible for Geometric Dimensioning and Tolerancing (GD&T) sufficiently trusted Autodesk Point Layout and the solutions it offered.



# Customer Video





# AdvancedTechnology

## Meanwhile, some problems

- Wi-Fi connection (sometimes broken connection)
- system of coordinates in the new app update was wrong scale

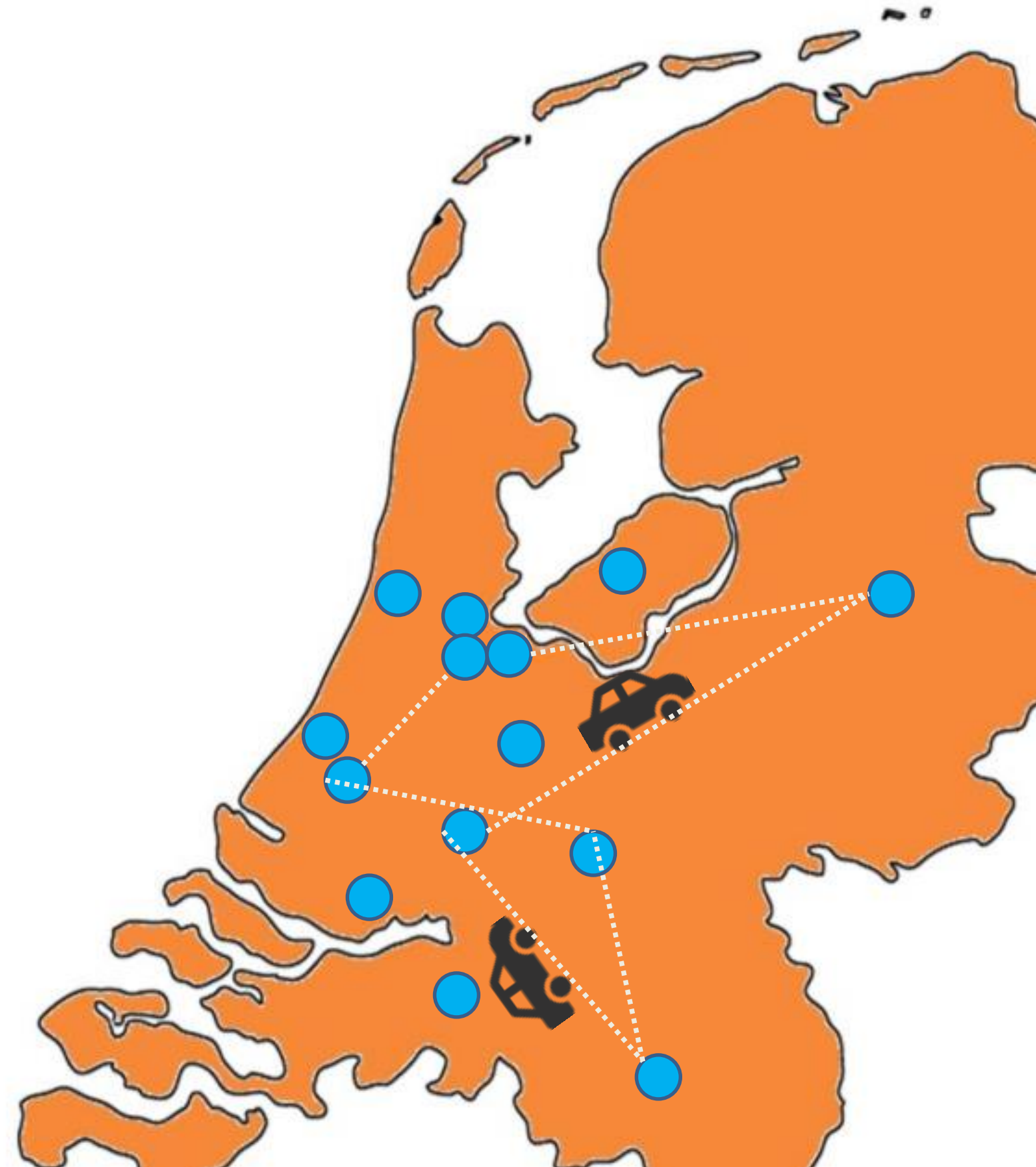
**All this was solved within one week.**



# Current Situation for APL

## Current method of working

- A GD&T supervisor creates and prepares the points in a CAD application.
- He is in charge of 7 teams.
- Delivers the files to site
- Only based on CAD

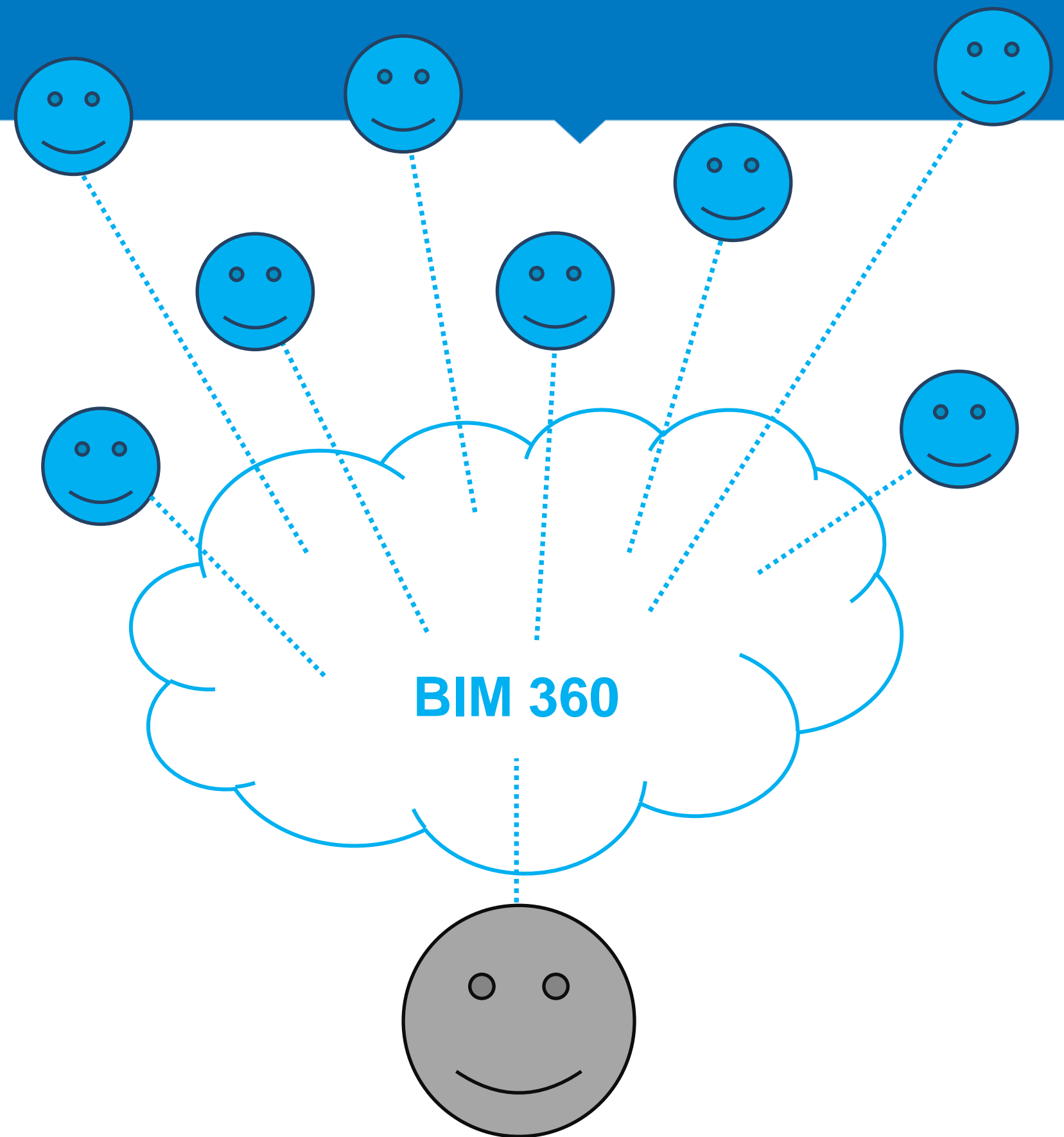




# Method of working

## BIM 360 Point Layout method of working

- A GD&T supervisor manages several project remotely.
- 2D and 3D ready for all possible systems
- LN-100 – DS-203i can be operated by 1 person



# Quote

***“We began dimensioning digitally to prevent errors and to save time”***

*Arjen van der Klis, TBI*





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# Summary

- Reduced errors and rework
- Scalable BIM enabled hardware
- Integrated with Autodesk BIM 360 tools
- Collaborative 3D model in the field
- Faster and accurate layout and QA, clear ROI
- Simple, Safer one-person operation





# Current Status

## TBI – Era Contour

- People trained to use BIM 360 Glue and BIM 360 Point Lay-out
- Invested in latest imaging robotic total stations





# ROI

- Simple and better work with visual display
- Software is user-friendly and intuitive
- Scalable in Cloud
- Possibility to work alone (no teams of 2 people)
- Low cost investment in hardware





# Next Steps

## TBI – Era Contour

- Link points to issues in BIM 360 Field
- Each project a dimensioning engineer (Timmerman)
- As-built information and analysis using APL



# Investigate Topcon Mass Data Solutions





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